



NORTH CAROLINA

Department of Transportation



An Introduction to State and National Transportation Research

Neil Mastin, PE – R&D Manager

June 2017

Covered in this Presentation

- NCDOT Research and Development Program Basics
- Finding Completed Research
- National Activities
- Successful and Ongoing Projects
- How you can be involved!

Research Program Basics

Annual Research Program

Match NCDOT research needs with expertise at universities and transportation research centers



Initiate ~20 - 30 new projects per year




More than 80 active research projects and programs



Nearly all NCDOT activities are eligible for research funding

Annual Research Program Goals

- 
- 1. Improve NCDOT Planning, Engineering and Business Practices
 - 2. Support NCDOT Operations and Maintenance Activities
 - 3. Conduct research that can be implemented
 - 4. Develop relationships with researchers so they understand the needs and operations of NCDOT to maximize research benefits

Annual Program FAQ

Who typically submits Research Needs?

Anyone at NCDOT,
with manager approval

University researchers in coordination with DOT business units

Who decides on what projects are funded?

NCDOT selects all projects through a multi step process

How long does it take for an Idea to become a project?

Typically 1 year from close of solicitation period*

*Contingency funds are available for rapid / off cycle needs

Annual Program FAQ (2)

How long do
Research
Projects Last?

Variable

2 years is
typical, can
be as short as
6 months or
as long as 3
years

What types of
Projects are
common?

Laboratory / Field
Testing and Analysis

Policy / Practice /
Design

Best Practice
Synthesis

Etc, etc.

How are
Projects
managed?

Research Unit
handles fiscal and
contract portion

Steering
Committee reviews
technical content

Committee Chair is
often the idea
submitter

Project Selection Oversight

Research and Development Unit Oversees Overall Program

Solicits Ideas

Research
Engineers
Manage
Projects

Coordinates
all Activities

Research Subcommittees Review and Recommend
Proposals for Funding

Environmental

Structures and Geotech

Pavement, Materials,
Maintenance

Planning, Policy and Transit

Traffic, Mobility and Safety

Research Executive Committee
Approves Work Program

Senior
Management

Executives

How is Research Funded?

State Planning and Research (SPR) Part 2 – (0.5% of Annual Federal Allocation)

- Annual Work Plan (80% / 20% Match)
- NCHRP Studies (100%)
- AASHTO Pooled Fund Program (100%)

Federal Discretionary Funds

- Typically Grants - (Often 100 % Federal)

State or Other Federal Funds

- TIP Projects
- Maintenance/Resurfacing Funds
- HSIP Funds etc

Updated Research Program Annual Timeline



Past and Present University Participants

Appalachian State*

Duke

East Carolina*

Elizabeth City State

NC A&T*

NC Central*

NC State and ITRE*

UNC-Asheville*

UNC-Chapel Hill and
HSRC*

* Master Agreements

UNC-Charlotte*

UNC-Greensboro

UNC-Wilmington

Indiana State*

Michigan State*

Virginia Tech*

Central Florida*

Illinois

Auburn

Current Research

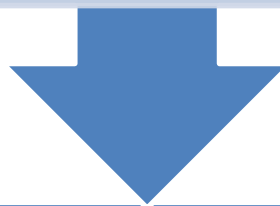
Technical Assistance

Need a quick hit project?

Lab testing?

White paper writing?

Survey conducted?



Try our technical assistance program

Managed by ITRE

Easily contract with
expertise across the state

Limited to 80 hours of
investigator time

NCDOT Web Resources

<https://connect.ncdot.gov/projects/planning/Pages/ResearchAnalysis.aspx>

Research Forms

Quarterly Newsletter

Current and Past Projects and Reports are Online

Easiest way to find us: Go to google and search for “NCDOT Research”

Finding Completed Research

Online Transportation Report Research Resources

NCDOT Project Page

- <https://connect.ncdot.gov/projects/planning/Pages/ProjectSearch.aspx>

TRID Transportation Research Database

- Largest of it's kind in the world
- <https://trid.trb.org/>

Google Scholar

- It's Google, so you know there is a lot of data
- <https://scholar.google.com/>

Research Library Services (If you need help finding it)



Completely revamped and reorganized library

On-staff Librarian provides Research Services -
Has access to national databases

Many engineering and transportation related
books, journals, specs and other documents

Historical information to the 1920s

Board of Transportation Minutes

Online Catalog: <http://ncgov.nccardinal.org/eg/opac/home>

National Research Activities

National Initiatives



Long-Term Pavement
Performance Study



Pooled Fund – NCDOT
Manager



National
Representative



Research Advisory
Committee
Representative



Coordinator for NCHRP
Pooled Funds

Transportation Research Board (TRB)

<http://www.trb.org/Main/Home.aspx>

Largest Organization of
Transportation
Professionals in the
World. Part of NASEM*

Annual Meeting Brings
together 12,000
practitioners, researchers
and policy makers.
Attendance is free to NCDOT
employees

Create a MyTRB count
and become a Committee
Friend or Member to stay
on top of technical
developments

Sign up for free topical
newsletters

Free webinars!
These often include PDHs
and you can subscribe to
notifications by topic

Hundreds of journals and
articles free to download
with your DOT email
address. Hard copies
available as needed.

*National Academies of Sciences, Engineering and Medicine

NCHRP

National Cooperative Highway Research Program

<http://www.trb.org/NCHRP/NCHRP.aspx>

Managed by TRB,
supported by States
and FHWA

Approximately \$44M
annual budget (NC
sends about \$1.1M)

YOU can submit ideas

YOU can participate in
project panels

Practical expertise
needed to guide
projects and move
research into practice

NCHRP Project 20-44
design to help with
that

Pooled Funds

<http://www.pooledfund.org/>

Managed by FHWA with NCHRP Support

A group of states decides that “XYZ” needs researching.

Proposal is written, funding is solicited from peers. If commitment is met, research is advertised

Each paying state gets at least 1 Technical Advisory Committee (TAC) Member

NCDOT currently participating in about 20.

- If you see something on the website above and have questions or wish to participate, let me know

AASHTO Technical Service Programs (TSPs)

<http://sp.www.transportation.org/Pages/Programs.aspx>

Funded by R&D and covers many support activities including

- Lab Certification
- Continue access and update to LRFD
- Approved products evaluation
- Snow and ice support groups etc

DOT reps are assigned to each program

Local Technical Assistance Program (LTAP)

<https://itre.ncsu.edu/focus/ltap/>

Managed by ITRE

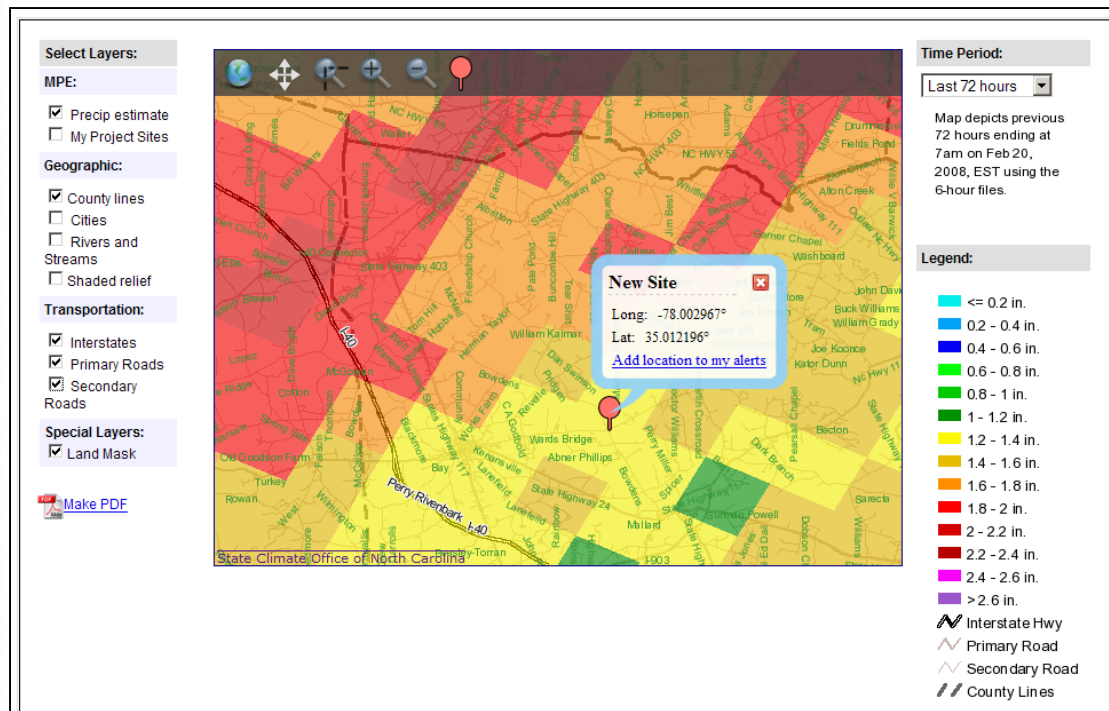
Technical and policy training for local agencies

“Roads” Scholar Program to train transportation workers and supervisors

NCTROADS is a mailing list for information exchange

Successful Projects and Ongoing Research

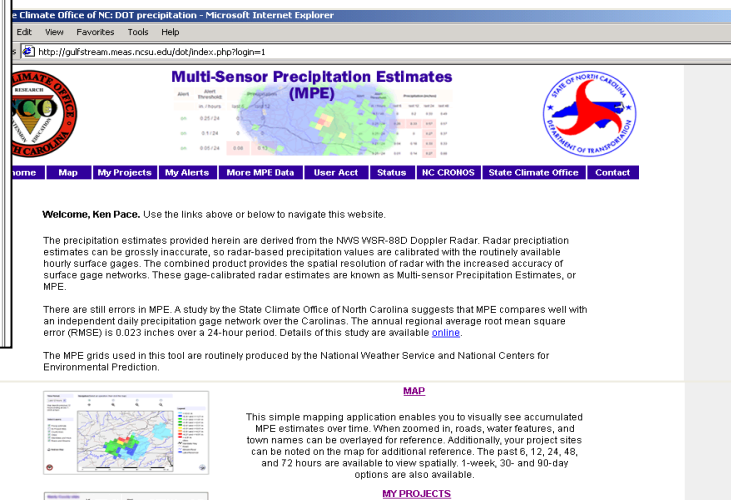
<https://connect.ncdot.gov/projects/planning/Pages/ProjectSearch.aspx>



<http://www.nc-climate.ncsu.edu/dot>

RP2012-34

Enhancements to Precipitation Alerts



Project Name	Lat	Long	Alert	Alert Threshold	Precipitation (inches)	More Data
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert
10-10-10	35.00	-78.00	Alert	0.10	0.10	Alert

MY PROJECTS

This page shows a list of all projects that you are subscribed to receive precipitation alerts from. Each project has a list of associated sites. Accumulated MPE values are listed for all sites in text format. You can also view all projects.

NC DOT Research Overview

The core of the State Climate Office's data warehouse, CRONOS is an integrated database of hourly and daily surface weather observations from different weather networks in and around North Carolina

RP2017-15

Rail Corridor Trespass Severity Assessment

994 pedestrian rail trespass casualties in U.S. last year – 23 in N.C.

Cameras installed along Piedmont rail corridor – Charlotte to Raleigh

Predictive model to estimate trespassing occurrences in high trespass locations



RP2017-27

Storm Water Infiltration and Pollinator Habitat Zones Along Highways

Research plots to evaluate Vegetated Storm Water Control Measures (SCM)- critical for reducing storm water runoff

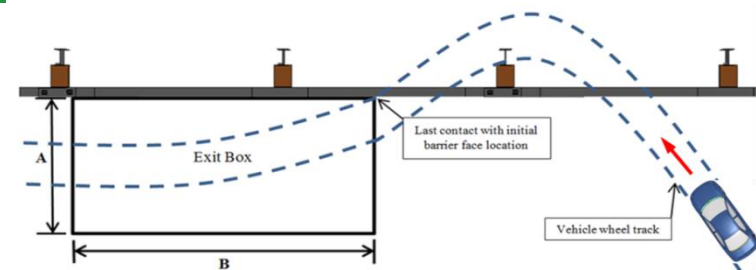
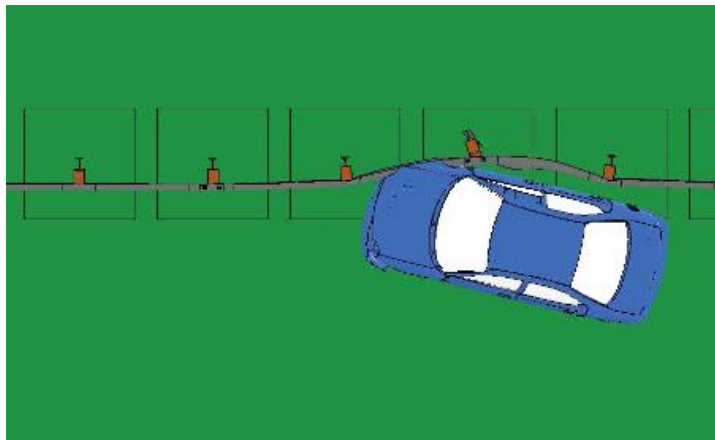
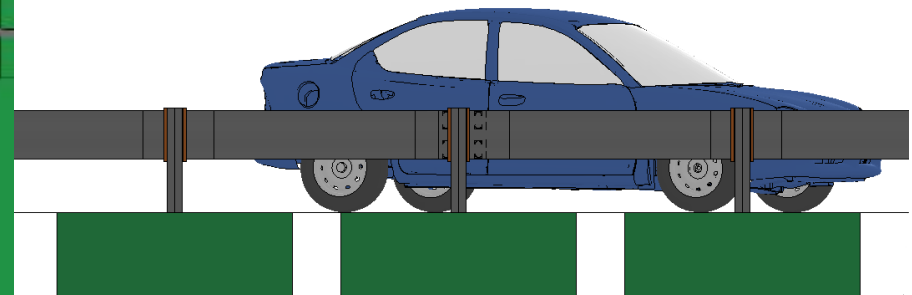
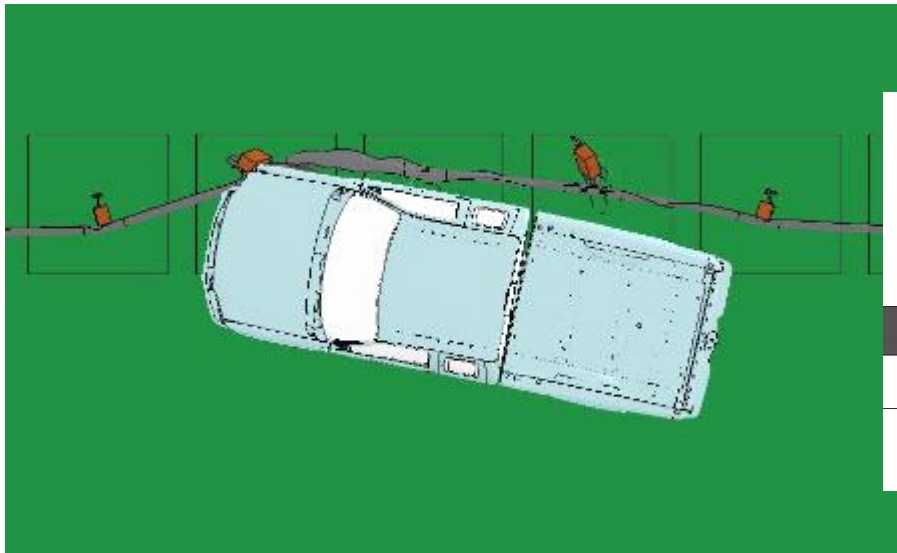
Quantify net benefits of roadside infiltration strips & SCMs

Monitor pollinator populations to quantify benefits of SCMs to pollinator communities



Multiple Projects

Finite Element Analysis of Guardrail Vehicle Impact



Are guardrail designs safe for different types of vehicles?

RP2014-09

Non-corrosive Carbon Fiber-reinforced Polymer Reinforcement (CFRP) in Pre-stressed Cored Slabs

Internal steel reinforcement corrodes – especially bridges in marine environments

CFRP alternative to steel reinforcements

Destructive full-scale testing at NCSU CFL

RESULTS: complete design procedure developed

RESULTS: reduce frequency of maintenance, repair and replacement



RP2013-13

Improvements to NCDOT's Wetlands Prediction Model

Desired improvements and automation in GIS predictive modeling based on NC Wetland Assessment Method (NCWAM)



Leading to automated identification/mapping riparian areas

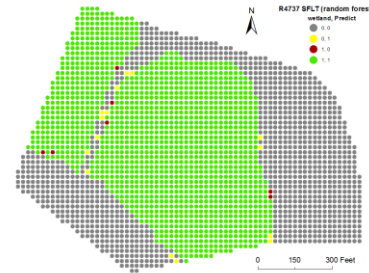
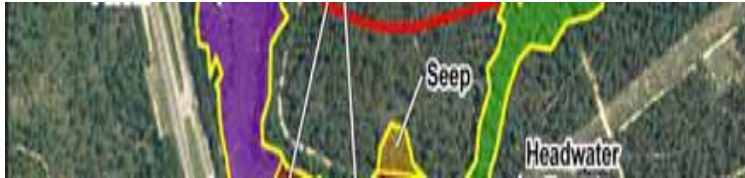


Speeding the ability to characterize and develop high-level functional assessment of predicted wetlands based on NCWAM



Overall Goal: Improved LiDAR-based wetland prediction models with **highly automated, reliable** and **user-friendly** tools based on ArcGIS

RP2013-13 Return on Investment

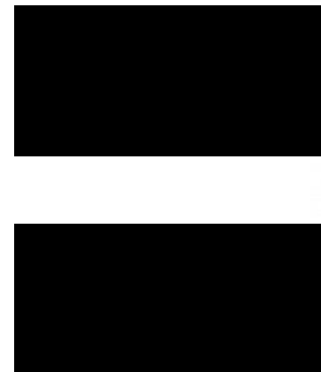


Initial savings on one project =
\$350K

Cost of Project = \$287K

Project has paid for itself

2-3 projects per year x 20 Years =
\$14M + in Savings



Pavement Research

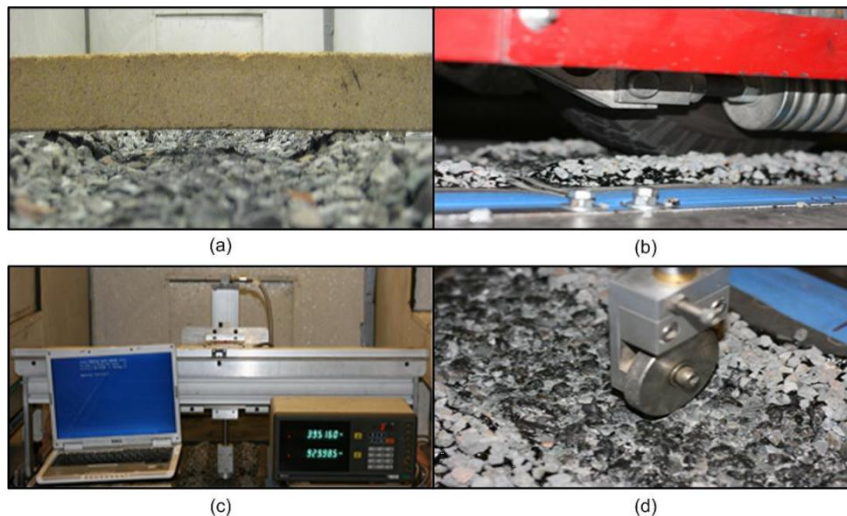
Chip Seals

Optimizing Gradations for Surface Treatments

Quantifying the Benefits of Improved Rolling of Chip Seals

Performance-Based Analysis of Polymer-Modified Emulsions in Bituminous Surface Treatments

Over \$5M expended over last decade to improve preservation technology



Seal Improvement Research

Examples of New Projects Kicking off in FY2018

New Initiative: Technology Transfer (T²)

Beginning an effort to rapidly move completed state and national research into practice with a focus on implementation and field deployment



One project manager has been converted to an Implementation Manager to facilitate T² activities and track deployment across the agency of other projects



Officially Soliciting Tech Transfer Projects

New T² project to field test and validate the “Tack Lifter” developed during [RP2014-03](#)

*One research project can have a large impact in several areas:
Material Performance, Safety, Environmental Management,
Congestion Management, Project selection, Policy Goals*

*A well designed project results in cost savings, efficiency
improvements, longer lasting materials, safer highways – and more*



Getting Involved

We Need Research Ideas!



R&D can help develop and refine need statements
(or find someone that can)

Look for follow-up emails with reminders and info

[Link to Research Need Form](#)

[Link to Research Need Form Instructions](#)

Getting Involved

Submit Research Needs Statements

- The Research and Development Unit is available to assist
- Forms are available on our [website](#)

Review Active AASHTO and FHWA Pooled Funds

- www.pooledfund.org
- Are there any in which you think NCDOT should participate?

Submit NCHRP Ideas

- Projects that are large, national issues
- The R&D can assist in formulating ideas in detail

Targeted research using Branch/Division/Unit funds and Master Agreements with Universities

- These agreements are low overhead
- Projects can be established quickly

Surveys: Need information on practices in other states?

- We can distribute survey requests to all 50 states + AASHTO

Contact Info

Neil Mastin	Research Manager	919-508-1865	jmastin@ncdot.gov
Steve Bolyard	Mobility, Safety, Roadway Design, etc	919-508-1874	sjbolyard@ncdot.gov
John Kirby	Planning, Environment, Transit	919-508-1816	jkirby@ncdot.gov
Mustan Kadibhai	Pavement, Materials, Maintenance, Structures	919-508-1819	mkadibhai@ncdot.gov
Curtis Bradley	Implementation Manager	919-508-1832	cbradley8@ncdot.gov
Lamara Williams-Jones	Research Librarian	919-508-1820	lcwilliams2@ncdot.gov
General Contact		919-508-1790	research@ncdot.gov

Research Connect Page (for Forms, completed and active projects and more):
<https://connect.ncdot.gov/projects/research/Pages/default.aspx>

Research Directory Page:
<https://apps.ncdot.gov/dot/directory/authenticated/UnitPage.aspx?id=8781>



Thank You